THE CENTENNIAL AIR FORCE: THE FUTURE OF AIR POWER AT THE AIR FORCE'S 100TH BIRTHDAY

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20010601 035

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Published 2001 by RAND
1700 Main Street, P.O. Box 2138, Santa Monica, CA 90407-2138
1200 South Hayes Street, Arlington, VA 22202-5050

PREFACE

This research is provocative, extreme in nature, and intended to ignite your imagination as well as to open the debate on what the character and role of the Air Force should be at its 100th birthday in the year 2047. The Centennial Air Force structure and culture during this time will be based both on the national power status of the United States relative to the rest of the world as well as the acquisition and procurement decisions made now and in the next 20 years. Historical precedence suggests that all great powers eventually decline relative to other world powers. The key to the future is to look at the proportion of decline the U.S. is in now (if it is) and what it could be over the next half century and then project the possible challenges that could face America's own security. The status of America in the world arena and the challenges to her security demand both a credible and visionary Air Force. Over the life of the Air Force there has been an ever-increasing timeline for the development and fielding of our weapon systems. Newer and more sophisticated weapons are being operated for longer periods because we cannot afford the replacement costs. The Air Force has also witnessed the birth of space and information warfare and is leading in its missionization. As we move forward, we need to make tradeoffs between air-breathing, space-based platforms and information/knowledge-based systems. The information revolution will bring to the forefront the role of information as a center of gravity for our operations as well as a target for our enemies. This emphasis on information and knowledge will necessitate a new national war-fighting structure, doctrine, and forces.

Research at RAND in Project AIR FORCE is normally proposed, approved, and conducted through a formal review process that involves obtaining guidance from and interaction with an Air Force customer. This study was conducted as a purely independent endeavor by two Air Force Fellows resident at RAND as part of a tour of duty to fulfill in-residence Senior Service School requirements. Although the RAND staff provided material and intellectual support, the opinions expressed herein belong strictly to the authors and do not represent those of RAND or the U.S. Air Force.

This report is provided for your reading and consideration. The only known result when attempting to predict the future is that you will not be 100 percent correct. It is the authors' hope that the report will spawn discussion allowing the Air Force to be prepared for its 100th birthday. If you desire to comment on this report, please send your comments directly to Project AIR FORCE, RAND, 1700 Main Street, Santa Monica, California, 90407-2138.

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Project AIR FORCE, a division of RAND, is an Air Force Federally Funded Research and Development Center (FFRDC) for studies and analyses. It provides the Air Force with

independent analyses of policy alternatives affecting the development, employment, combat readiness, and support of current and future aerospace forces. Research is performed in four programs: Aerospace Force Development; Manpower, Personnel, and Training; Resource Management; and Strategy and Doctrine.

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SUMMARY

This research is provocative, extreme in nature, and intended to ignite your imagination as well as to open the debate on the character and role of the Air Force at its 100th birthday in the year 2047. The Centennial Air Force will most likely not look like or be structured like it is today. The U.S will face a myriad of threats brought about by competition for resources, the rise of a peer competitor in the international arena, and the use of information/asymmetric warfare. The ability of the U.S to ensure its security and remain a major political player in world affairs will be a direct result of its global power status relative to the rest of the world.

During the past 500 years, there have been numerous nations or states that have risen and then subsequently fallen from their great power status relative to the rest of the world. Professor Paul Kennedy believes there are certain indicators prevalent in the rise and fall of great powers and it's possible to determine the status of a nation based on its presence or lack thereof. His views are critical in looking at the future of America because Kennedy shows a causal relationship between the shifts of power that have occurred over time in the general economic and productive balances of a power and the position occupied by the individual powers in the international system. Moreover, the uneven economic growth between nations and resulting technology breakthroughs will increase the relative power of one country over others. (Kennedy, xiv-xv)

Most experts tend to compare Britain's rise to power and its decline to that of the U.S. Britain was the first country to embrace the industrial revolution full throttle and as a result benefited tremendously and entered a league of its own as the first industrial nation. This uneven economic growth propelled Britain's overall stature as a great nation. Its power subsequently declined because of the relative increases in production and economic and military power in other nations.

In the years between 1900-1945, the world was truly multipolar with each country becoming more immersed with each other economically, but for European countries, security still remained an issue. By 1914 and the beginning of WWI, Germany had become the new economic powerhouse in Europe and used its new position to attempt hegemony in Europe. The turning point of the war was the 1917 U.S (and its massive production capability in its own right) entrance into the fray.

The United States first hit the world scene following the Civil War—the first true industrialized "total war." The Civil War transformed the amount of resources America devoted to technological capabilities, resulting in numerous economic and military innovations. The U.S exploited its rich agricultural land, vast raw material, and the evolution of modern technology (railroads, the steam engine, and mining) to develop needed resources and exports. Following WWI, the U.S was one of the few nations to benefit from the conflict and became the greatest

financial and creditor nation and the largest producer of manufactured goods and foodstuffs. The United States had a larger output than the other six Great Powers taken together. After World War II, the United States was the breadbasket of the world, the steel maker of the world, and the auto manufacturer for the world. It was on top of the world partly because of its own productive capabilities but also because of the temporary weakness of the other nations. (Kennedy, 327-329)

Since 1945, the world has had a bipolar structure centered around the two superpowers—the U.S. and the Soviet Union. The U.S. has had to deal with two major wars as well as maintain a military to sustain the national strategy of containment against the Soviet Union and the other communist nations. America spent a considerable amount of its GNP on defense even at a time when its economy was suffering and falling in world productivity percentages and when it was in what some experts would claim was a decline relative to the other major world powers. However, the decline of the Bear coupled with the simultaneous explosion of the "knowledge revolution" has significantly slowed the U.S. decline. The U.S. now leads in every indicator of power except population and military personnel. (Kennedy, 427; Valery, 27)

The international structure of 2047 will be determined by the relative power of the United States compared with the other major powers. Current thoughts range from a unipolar world led by the U.S. to a world of chaos resulting from unprecedented social problems with no real power center to provide influence. Given the extremes, what types of challenges are foreseen for the United States by the year 2047?

There are three likely challenges that could confront the U.S. and affect not only national security but international stability as well. These include a peer competitor to the U.S., resource conflicts, and information/asymmetric warfare. A peer competitor is the most likely and difficult of the challenges for the U.S. and could threaten its national security interests throughout the world. The two most likely nations or states to present such a challenge are the European Union and China.

History suggests the European Union will still be a union of integrated but separate nation states by the year 2047. China, on the other hand, is a different story. Experts in Asian affairs and some political analysts believe China will have the largest economy in the world by the mid 21st century and will be ranked second in the world power grid with a GDP larger than that of the U.S. and European Union combined by 2020. China's armed forces are currently modernizing now for the "information-dominated" battle space, and if its economy continues its high rate of growth, by the year 2020 some of that economic power could be leveraged toward new technological advances in parity with the United States before mid-century. (Shambaugh)

China's highest priority for strategic modernization is in the realm of information. The People's Liberation Army (PLA) is developing doctrine and systems designed to enable targeting of adversarial strategic and operational centers of gravity, and defend its own, in order to pursue limited political objectives with an "asymmetrical economy of force." China will be prepared to

fight the U.S and seek regional hegemony—it has already started to counter the highest profile weakness of the U.S., its reliance on technology and computers. (Stokes, 28)

Another challenge for the U.S. will revolve around energy and resource issues in 2047. Environmental factors in the past have indirectly contributed to conflict, but with the environment coming under greater stress and resources diminishing, such factors could be direct causes of conflict by mid-century. U.S. forces may be needed to ensure adequate supplies for itself and Western democracies. The U.S is the world's largest consumer of energy, but energy consumption is growing rapidly in Asia. As development continues, future demands for resources will rise in China and Asia. Water scarcity will have the greatest potential for instigating conflict and world instability. The international community will most likely look to the U.S. to ensure equitable distribution and mitigate regional conflicts from escalating into a global conflict.

Information/asymmetric warfare is likely to remain a major challenge for the U.S. through the mid-century. Technologically advanced, information-intensive nations are more vulnerable to information-based warfare simply because they are so information dependent. (Ryan, 114-115) In 2047, the most likely warfare against the U.S. will be targeted against its economic and national infrastructure. This battlefield will be as threatening as any encountered in military warfare. Moreover, the nations of the world will have become so intertwined as a result of the international dependencies associated with the global economy that national sovereignty could be redefined, and conflict between nations and non-government organizations could be as likely as those between two nation-states.

To meet the variety of traditional and nontraditional threats by 2047, the United States needs to have a unified command structure organized under a single CINC who employs expeditionary forces and is capable of integrating allied war-fighting forces in a synergistic campaign. The globalization of threats and their asymmetric nature demands the U.S. look at the world as a whole and not arbitrarily divide the world into independent regions. We must be prepared for the asymmetric challenge and to deal with foreign challenges that appear to emanate from within our borders—such as a cyber attack.

The United States Combatant Commander will be responsible to the National Command Authority (the President and the Secretary of Defense) for guidance and direction. The CINC will work hand-in-hand on a daily basis with the Secretaries of Defense, State, and Justice. The diversity of threats demand the integration of government effort to ensure that ongoing and planned operations support the national political objectives. The new Combatant Commander will have a continuing broad ranging mission. The CINC will monitor and prepare for changes required by day-to-day political and diplomatic maneuvering with foreign countries and non-government agencies. The CINC will be responsible for planning and executing attacks on adversaries at all levels of operations from covert warfare to major war. By 2047 most of our

forces will be based in the United States; we will use an expeditionary force concept to remain engaged, deploying on a regular basis to exercise and operate with our allies.

To address the asymmetric nature of conflict, the U.S. will need to adopt a new definition of the enemy and a new war-fighting doctrine. This definition and concept is the cornerstone of information-centric nodal warfare. Put simply, we can no longer think of the enemy as a country or its leader. The true enemy and the focus of our effort must be the enemy leader's mind. The leader in this case is the individual or group of individuals who have the capability to change the enemy's present course of action.

Information is the key to affecting the enemy leader's mind and it has long been recognized as a key to warfare. In the past, information on the enemy's location allowed forces to close and join in combat. Today, information is used to avoid opponents' strengths. Information will be the focus and reason for employing forces. Information will allow us to know who *"really"* controls the adversary power, enable us to select methods that will convince or coerce him, and determine how we select targets. In some cases, it will be the weapon itself.

The primary target using information-centric nodal warfare is the leadership; other targets include a country's industrial capacity, national will, and, ultimately, national survival. The desire is to attack the primary target, but that might not be possible. So you attack other targets that act as nodes to the leadership. In this doctrine, the enemy leader's mind is the center of gravity. If you can't attack the leader's mind, you influence and attack the information that feeds the decisions. The information might have to flow from various sources at ever-expanding distances to the leader.

The information-centric nodal warfare construct will be used by the National Command Authority; the Departments of State, Defense, and Justice; and the Combatant Commander to decide on a course of action. Further, it will aid in deciding which instruments of power to use to affect the information flow to the adversary's and enemy's leaders' minds. The construct is applicable at the tactical, operational, and strategic levels.

The Centennial Air Force will be the leading force in 2047. Airpower is just coming of age. Mankind has walked the earth for a millennium and has successfully navigated the high seas since the time of Columbus. However, the aerospace environment is just beginning to be — Orville and Wilbur Wright's 1903 historical 12-second powered flight is not yet 100 years old.

The Air Force today is the preferred vehicle of National Power. Air and airpower doctrine have, since their birth, been looked upon as a way of avoiding the carnage of force-on-force combat. The Air Force grew out of the need to go around fielded forces. In the future, the Centennial Air Force will continue using the air and space environment but will also go around fielded forces by using information warfare as a weapon in the cyber environment.

The Centennial Air Force must embrace the cyber environment as a medium of employing information-centric nodal warfare. To fully embrace airpower's true potential, the Centennial Air

Force will stand-up a cyber corps. The inclusion of cyber is similar to the development of space. With cyber, like space, the purpose of the existing force is in some degree replaced and in other cases enhanced with the addition of the new medium. To employ information-centric nodal warfare, the Air Force must develop an information warrior culture. This culture must be information based and include the application of force through air, space, and cyber. The culture of the U.S. Air Force will have to expand from one of employing air and space forces to one of employing air, space, and cyber forces to gain an informational advantage. In a sense, every Air Force member will be an information warrior, with each operating in various mediums—electronic, free space, and vacuum.

We must avoid the current limiting description of Air Force missions and focus on enabling technologies in two arenas: freedom of operation and counter operations. Freedom of operation is any action taken or equipment that enables our forces to have uninterrupted control of the information flow to the enemy leader(s). Counter operation is any action taken that stops the enemy from controlling information to our leaders. In this pursuit of information dominance, keeping a close eye on what other countries, nations, corporations, and independent actors are pursuing is paramount. Once a technology is started and pursued it is hard to stop its progress.

Today, in an extraordinary time, we are witnessing the birth of an extraordinary revolution. . . one of information and knowledge. The Air Force is today at the forefront in attempting to master the use of information and knowledge in warfare as the ultimate "over the horizon weapon". Information/knowledge is just another method of warfare and is the ultimate use of air and space to go around fielded troops. The future that awaits our Centennial Air Force will have extraordinary challenges based on this revolution. If we are not willing to accept the fall of our great nation, then we must use our innovative strengths, which have been the foundation of America since its birth, to meet the future head on, with our eyes open, and we must start today.

ACKNOWLEDGMENTS

The authors express their heartfelt appreciation to the many individuals who guided and encouraged us throughout this research effort. From intellectual guidance to technical editing, many individuals contributed countless hours helping scope, refine, and justify our work. We cannot begin to thank all the contributors by name, but we want everyone who assisted to know we will always be grateful for their support.

Several individuals deserve special recognition for their contributions to this effort. Tim Bonds and Myron Hura served as our mentors, helping guide the research and documentation of the project. Glenn Kent of RAND and Tom Parry, Keith Anthony, and Steve Dizek of the National Air Intelligence Center deserve special recognition for the insight and inspiration they provided the authors. Dan Norton of RAND helped make sense out of the mounds of historical budget numbers. Tim Bonds, Myron Hura, CAPT(S) Marvin Heinze, Lt Col Dave French, David Smith, and Jamie Michaels also provided extensive review and comments, greatly improving the report's content and structure. Finally, Jeanne Heller and Emily Rogers provided extraordinary assistance ensuring this report had a quality appearance.

Although numerous people contributed their time and efforts in support of this report, we remain responsible for the judgments and observations contained herein.

1. THE WORLD OF 2047 – AN INTRODUCTION

"Predicting is tricky business, especially when it's about the future"—Yogi Berra

In the year 2047, the United States Air Force will be 100 years old and most likely will not look like or be structured like it is today. The U.S will face a myriad of threats brought about by competition for resources, the rise of a peer competitor in the international arena, and the use of information in warfare. The ability of the U.S to ensure its security and remain a major political player in world affairs will be a direct result of its global power status relative to the rest of the world. As a major world power or possibly a superpower, America will respond to the challenges with the evolution of both its military structure and military doctrine. Such an evolution will find the Centennial Air Force, with its inherent speed and capability as an "over the horizon" weapon, as the leading force behind America's security and projection of force.

Today the United States is the lone superpower in the world capable of global reach and conducting or organizing politico-military action anywhere in the world. Interestingly, in the late 1980s many internationally known political experts were talking about the decline of U.S power relative to the rest of the world and its decreasing influence in world affairs. So what has happened to change those views and how does one determine the relative power of one nation over another? What allows one state to rise while another falters from the world power grid? Has the U.S. followed the same path of decline or has it recovered given its current "superpower" status? Will it eventually decline based on historical precedence? What will be the status of the U.S. relative to the rest of the world when the Air Force turns 100 years in 2047? Scholars and professors of international relations have attempted to answer these questions in an effort to better predict the future international order and stability. In our attempts to determine the future of the United States, we will look at one expert's use of history to argue that certain events have repeatedly presaged the downfall of a nation from its relative power status. Reviewing these events will allow us to make a judgement concerning the United States' current and past status as well as its future role in world affairs. A review of five well-known political scientists' forecasts will be the launching point for determining the future challenges for the U.S. based on its position in the world and the need for an evolutionary Air Force to meet those challenges.

How will the Air Force and the military structure of the U.S. need to change to confront future challenges? It's our contention that to ensure the security of America a new national military structure will be required with a new doctrine centered on information-centric nodal warfare and an evolutionized Centennial Air Force. Such a preeminent force will be well integrated with a set of quivers ready for Combatant Commanders to use to deter regional/world

hegemony, ensure freedom of operations and counter operations, and help maintain world stability.

2. HISTORY AS A PREDICTOR FOR GREAT POWER DECLINE

During the past 500 years, there have been numerous nations or states that have risen and then subsequently fallen from their Great Power status relative to the rest of the world. Have certain factors been prevalent during each of these cases and is it possible to determine if the U.S. has started on its own road of relative decline? Professor Paul Kennedy, in his book *The Rise and Fall of Great Powers,* takes a comprehensive look at the rise and fall of great powers since the dawn of the modern era (1500AD). He contends that the relative strengths of the leading nations in world affairs never remain constant, principally because of the uneven rate of growth among different societies and the technological and organizational breakthroughs that bring a greater advantage to one society than to another. (Kennedy, xv) Kennedy asserts that several conclusions can be argued: first, "there is . . . a causal relationship between the shifts which have occurred over time in the general economic and productive balances and the position occupied by the individual Powers in the international system"; second, "there is a very clear connection in the long run between an individual Great Power's economic rise and fall and its growth and decline as an important military power (or world empire);" and finally, "in a long-drawn out Great Power war, victory has repeatedly gone to the side with the more flourishing productive base." (Kennedy, xxiv) The examples that follow support his conclusions and allow us to look more closely at the United States and what this historical precedence could mean by mid-century.

PRIOR TO WORLD WAR I

In the years between 1750 and the start of World War I, the Great Power scene matured into a genuinely multipolar system of European states, each of which continually made decisions about war and peace on the basis of "national interests". Technology from the industrial revolution soon began to impact military and naval warfare, giving Europe a decisive military advantage over the rest of the world. Britain's rise and fall from the great power scene, the Allies' win in WWI and WWII and the North's win over the South in the United States, point to one general conclusion; "the powers which were defeated were those that failed to adopt to the "military revolution" afforded it by the industrial revolution and subsequent civilian innovations to include the acquisition of new weapons, the mobilization and equipping of large armies, the use of improved communications offered by the railway, the steamship and the telegraph, and a productive industrial base to sustain the armed forces.

Most experts tend to compare Britain's rise to power and its decline as a great power to that of the U.S. Britain was the first country to embrace the industrial revolution full throttle, benefiting tremendously and entering a league of its own as the first industrial nation. The technological advances in machinery allowed Britain to dominate the world manufacturing

output, resulting in an unprecedented economic capability. Between 1760-1830, Britain was responsible for two-thirds of Europe's industrial growth output, and world manufacturing increased from 1.9% to 9.5% and further to 19.9% in 1860. (Bairoch, 294, 296) Britain was responsible for producing 53% of the world's iron and 50% of coal, and over one-third of the world's merchant marine flew under the British flag. (Bairoch, 291) Using technology and the resulting innovations allowed Britain to achieve economic super power status and of all the nations was considered the premier power.

Britain's overall stature as a great nation was affected by the uneven economic growth resulting from the industrial revolution and subsequent technologies. The industrial revolution transformed the other regions of the world and the pace of that change made the international order in this multipolar world more precarious. Breakthroughs in science and technology were significant and new advances in manufacturing production could now be transferred from one continent to another in the matter of years vice centuries. Global trading, the volume of world trade, and the growth of manufacturing output increased swiftly. Economically, Britain's relative share of world production steadily diminished. It's

> Industrial production was only 1.5% between 1875-1894, down from 4% between 1820-1840; total world manufacturing which was 22.9% in 1880 dropped to 13.6% by 1913 and its world trade percentage dropped from 23.2% to 14.1%. Britain's share in global commerce had also plummeted from 14.5% in 1913 to 9.8% by 1937. In contrast, the U.S. and Germany's relative share in world manufacturing output rose from 14.7, and 8% respectively in 1880 to 32% and 14.8% respectively in 1913. (Kennedy, 228)

The iron and steel production capacity for the UK only slightly decreased from 8 million tons in 1890 to 7.7 million tons in 1913, while those in the U.S. more than tripled to 31.8 million tons, and Germany's rose four time to 17.6 million tons. The United Kingdom, once the economic center and powerhouse of the world, found itself in third place relative to the U.S. and Germany in absolute power and in a slow decline relative to the rest of the major powers. (Bairoch, 296, 304)

Clearly, this quick review of Britain's rise to be the strongest economic power follows Kennedy's assertions about economics, the military, and technology. However, as witnessed by its decline, its power was diminished because of other nations' uneven economic growth and relative increases in production power. The power shift in Europe occurred as Britain's production and economy increased or decreased relative to the other great powers. According to Kennedy,

> All the major shifts in the worlds military power balances have followed alterations in the productive balances and the rise and fall of great nations and states has been confirmed by outcomes of great power wars, where victory has always gone to the

side with the greatest material resources. (Kennedy, 439)

In the years between 1900-1945, the world was truly multipolar, with each country becoming more emersed with each other economically, but for European countries, security still remained an issue. Both WWI and WWII are perfect examples of how one country can use technology and its strong economy to build an enormous military machine and as a result rise to power relative to the rest of the world. It is also a testament to how the strategic overextension of one's armed forces at the expense of its economy's productive ability will lead to defeat in war and ultimately a fall from power.

WORLD WAR I

By 1914 and the beginning of World War I, Germany had become the new economic powerhouse in Europe and used its position to attempt hegemony in Europe.

> Germany had surpassed the combination of Britain, France, and Russia in steel production with 17.6 million tons. Exports tripled between 1890-1913 and Germany became second to Britain in the merchant marine. World manufacturing production percentages were higher than Britain's at 14.8%, propelling Germany as the new economic powerhouse in Europe. The military buildup was equally impressive and began with the army budget increase from $204 million to $442 million followed by a rapid buildup of the Navy. (Calleo, 66,68)

The coalition of Britain/France/Russia should have had the productive clout to take on the Central Powers, but Germany had prepared too well and had invested in a strong infrastructure to manage the war effort. The turning point of the war occurred in 1917 with the U.S. (and its massive production capability in its own right) entrance into the fray. Additionally, by this time Germany had overextended and stretched its armies beyond its economic production capability to support the first three years of the war. (Kennedy, 258, 271) The UK/US/France alliance had a significant advantage over the Central Powers in terms of percentages of world manufacturing production, energy consumption, steel production, and overall total industrial potential (Table 2.1).

Table 2.1

Industrial/Technological Comparisons of the 1914/1917 Alliances

	UK/France/Russia	Germany/Austria	UK/US/France
Percentage of world production (1913)	27.9	19.2	51.7
Energy consumption (1913) metric million tons of coal equivalent	311.5	236.4	798.5
Steel production (1913) in million tons	17.1	20.2	44.1
Total industrial potential	261.1	178.4	482.6

(UK in 1900 = 100)

These figures clearly show that the Central Powers could not over the long run outweigh the allies' sheer economic muscle once the U.S. entered the war. According to Kennedy,

> ...during the course of the conflict...the early stalemate, the ineffectiveness of Italy, the slow defeat of Russia, the decisiveness of American intervention in keeping up the allied pressures and the eventual collapse of the Central Powers – correlates closely with the economic and industrial production and effective mobilization of forces available to each alliance during the different phases of the war. What the allies enjoyed was a marked superiority in productive forces, and as in earlier, lengthy coalition wars, that factor eventually turns out to be decisive. (Kennedy, 273)

WORLD WAR II

World War II is yet another but stronger case for Kennedy's thesis on how nations rise and fall from their relative power role in the world. Despite their defeat in WWI and the Versailles Treaty limits, Germany's world manufacturing output and "relative war potential" were both about equal to that of Britain and France combined by 1938. The entry into the war of the United States and Japan in 1941 made WWII truly global. With the entry of the United States, the allies now had twice the manufacturing strength, three times the "war potential," and three times the national income of the Axis powers. (Kennedy, pgs 330-332)

Table 2.2

Comparison of Allies/Axis in 1938

	US	USSR	GER	UK	FR	JAP	IT
1938 shares of world manufacturing output (%)	28.7	17.6	13.2	9.2	4.5	3.8	2.9
Relative income of powers (billions of dollars)	68	19	17	22	10	4	6
(1938) steel production in million tons	26.4[a]	16.5	20.7	NA	NA	6	NA
Relative war potential	41.7	14.0	14.4	10.2	4.2	3.5	2.5

[a]U.S. steel industries were working at only one-third capacity with two-thirds idle; other countries working at full capacity.

ECONOMICS AND POWER

The review of the rise and fall of select great powers from the modern era until the end of WWII has shown that indeed Kennedy's arguments can be used to help predict the fall of a great nation. Clearly an argument can be made that the rise and fall of Britain, Germany, and other nations have shown that dynamics for change is driven chiefly by economic and technological developments that affect the social structures, political system, military power, and position of individual states and empires. Additionally, throughout the rise and fall of nations the uneven

pace of economic growth had a long-term impact on the relative military power and strategic position of Britain, Germany, and the U.S as well as other members of the state system. This pattern was most apparent in the years between WWI and WWII. Finally, major shifts in military power balances occurred after significant alterations in the productive balances after conflicts, with the victory always going to the side with the greatest material resources. So where does that leave the United States and its rise to elite power status and is it in a decline relative to the rest of the world, as Kennedy asserts?

3. THE RISE OF THE UNITED STATES AS A SUPERPOWER

The uneven pace of world economic growth allowed the U.S. to close the gap with the European nations in relative power in the international arena. The Civil War thrust America into the industrial age and by the end of World War II, the United States had emerged as one of two superpowers in a bipolar globe. The fall of the Soviet Union in the early 1990s put America in a power class of its own relative to the rest of the world. Nonetheless, Kennedy's factors about economics, technology, and the military were present in what most political and international experts would agree was a decline in America's power in the 1980s. Even though it is the lone superpower today, that does not mean that slow decline could not once again increase and erode her power status if America does not stay vigilant.

CIVIL WAR

The Civil War was the first industrialized "total war." It transformed the amount of resources America devoted to technological capabilities and resulted in numerous economic and military innovations. Because the North enjoyed a stronger economy and significantly larger population, it was able to pursue technological innovations and capitalize on the weakness of the South. With such tremendous emphasis placed on technology, America began an economic and technological ride following the end of the war. The U.S. exploited its rich agricultural land, vast raw material, and the evolution of modern technology (railroad, the steam engine, and mining) to develop needed resources and exports. By 1898, American wheat production increased by 256 percent, corn by 222 percent, sugar by 460 percent, coal by 800 percent, and steel rails by 523 percent. The production of crude petroleum rose from 3,000,000 barrels in 1865 to over 55,000,000 barrels in 1898. (Pletcher, 120) By 1914, its national income was $37 billion, its population 98 million, and the per capita income $377 annually. (Wright, 670-671) It was producing 455 million tons of coal, well ahead of Britain's 292 million, and was the largest oil producer in the world. (Taylor, xxx)

WORLD WAR I

The U.S., one of the few nations to benefit from World War I, became the greatest financial and creditor nation and the largest producer of manufactures and foodstuffs. The United States had a larger output than that of the other six great powers taken together. On the political side, however, U.S. political influence was in no respect commensurate with its industrial strength. The American people decidedly rejected a leading role in world politics with all the diplomatic and military entanglements such a posture would produce. There were few reasons to get involved unless American commercial interest was affected. But the U.S. was so self-sufficient

that except for a few raw materials, the world outside was not vital to American needs. (Kennedy, 327-329)

WORLD WAR II

After World War II, the United States was the breadbasket of the world, the steelmaker of the world, and the auto manufacturer for the world. It was on top of the world partly because of its own productive capabilities but also because of the temporary weakness of the other nations. It had an industrial economy, which flourished, and it had military and technological strength that put the rest of the world on notice. Stimulated by the vast surge in war expenditures, the country's GNP rose from $88.6 billion to $135 billion in 1945. Of all the great powers, the United States was the only country that became rich because of the war. More than half of the total manufacturing production of the world took place within the U.S., which equated to a third of the world's production of goods of all types, making it by far the greatest exporter at the war end. Additionally, its economic power was reflected in the U.S. military strength, which at the end of the war controlled 12.5 million personnel. The navy was unquestionably second to none and America's command of the air was untouchable. The U.S. also possessed a monopoly of atomic bombs. (Ashforth, 268) With the traditional great powers of Britain, Germany, and France fading away, the U.S. steadily moved into the vacuum which was created. It is easy to see how the U.S. is compared to Britain at its zenith. Each country reached its power status on the basis of its economic clout, which then increased the power of the military.

1945 AND BEYOND

Since 1945, the world has had a bipolar structure centered around the two superpowers of the U.S. and the Soviet Union. The U.S. has had to deal with two major wars as well as maintain a military to sustain the national strategy of containment against the Soviet Union and the other communist nations. America spent a considerable amount of its GNP on defense even as its economy was suffering and its world productivity percentages were falling. In 1953, America's share of the gross world product was 44.7% and in 1980 it was 21.5%, whereas the percentage for Japan rose from 4.5% in 1960 to 9% and China from 3.1% to 4.5%. (Kennedy, 436) Additionally, America's productivity growth had fallen to approximately 1% per year by the mid 1980s. Clearly, by the mid to late 1980s many political experts were declaring that America had fallen into the same historical missteps of previous great powers and its national power was in a slow death spiral. However, the fall of the Soviet Union from superpower status catapulted the U.S. into unprecedented stature as the world's sole superpower. The decline of the Bear coupled with the simultaneous explosion of the "knowledge revolution" significantly slowed the decline of the U.S. relative to the rest of the world. Since 1992, the rate of productivity growth has been as high as 3% a year. (Valery, 27) In addition, the U.S. has maintained its military superiority, added to

its share of world product, manufactures, and high-tech production, increased its lead in productivity, and regained or strengthened its lead in many strategic industries. America's relative power in the late 1990s compares with that of Britain near its peak as well as that of the U.S. itself during the Civil War (Table 3.1).

Table 3.1

Indicators for the Major Powers, 1995-97

	Population (1996%)	Per Capita GDP (1997 PPP)	Manufacturing Prod. (1995%)	Military Expenditures (1996%)	Military Personnel (1996%)
United States	13	30.2	37	52	18
China	62	3.5	8	7	36
Japan	6	24.5	27	6	3
Germany	4	20.8	14	7	5
Russia	7	4.7	N/A	13	30
Britain	3	21.2	6	6	3
France	3	22.7	7	9	5

Sources: Central Intelligence Agency, *World Factbook, 1998*; (http://www.odci.gov/cia/publications/factbook/index.html); International Institute of Strategic Studies, *The Military Balance 1997/98* (London: IISS, 1998); World Bank, *World Development Indicators*, 1999 (Washington D.C: International Bank for Reconstruction and Development, 1999): and National Science Foundation, *Science and Technology Indicators, 1998* (http://www.nsf.gov/sbe/srs/seind98/start.htm).
Note: N/A: Data not available.

The United States also possesses a decisive advantage in "information age" measures. It not only has the largest high-tech economy in the world, it has the greatest concentration in high-tech manufacturing among the major powers (Table 3.2).

Table 3.2

Information Age Indicators for the Major Powers, 1995-1997

	High-Tech Manufacturing (1996%)	Total R&D Expenditures (1995%)	Defense R&D Expenditures (1995-96%)	PCs Per 10,000 People (1997)	Internet Hosts Per 1,000 People (July 1998)	Scientists & Engineers in R&D per Million People (1985-95)
United States	41	53	80	407	976	3,732
Britain	6	6	7	242	201	2,417
Japan	60	22	2	202	107	5,677
France	5	8	8	174	73	2,537
Germany	10	11	3	255	141	3,016
China	8	N/A	N/A	6	.16	537
Russia	N/A	N/A	N/A	32	9	4,358

Sources: World Bank, *World Development Indicators, 1999* (Washington, DC: International Bank for Reconstruction and Development, 1999); National Science Foundation, *Science and Technology Indicators, 1998* (http://www.nsf.gov/sbe/srs/seind98/start.htm); Organization for Economic Cooperation and Development, *Science, Technology and Industry: Scoreboard of Indicators, 1997* (Paris: OECD, 1997).
Note: N/A: Data not available

According to Mark Lander, the U.S. accounted for 35.8% of total world spending on technology in 1997. (Lander, p. C1) Japan accounted for 17.6%, Germany 6.6%, Britain 5.7%, and China 1.6%. In 1998, the Council on Competitiveness, an industry think tank in Washington, concluded America had not only regained its former strength but was now far ahead technologically in the five most critical sectors of the economy. (Valery, 27)

Militarily, the U.S. has the only worldwide global power projection capability. It has the world's only truly blue water navy, it dominates the air, and retains an "if needed" first-strike nuclear capability. Even though it spends only 3% of its GDP for defense, it outspends all great powers combined. Basically, America has significantly slowed if not stopped altogether what clearly was a gradual decline of its power status relative to the rest of the world. Given its current superpower status, what does that portend for the future?

4. POTENTIAL FUTURES FOR THE WORLD OF 2047

The relative power of the United States compared with the other nations will determine the international structure of 2047. It's possible that America will still be the lone superpower in a unipolar world like today. It is also possible that America's power will eventually begin a decline relative to the rest of the world and become one of several major powers on the political scene. The status of the U.S. and its influence on world dynamics is critical to determining our future military posture. The following four noted authorities in international relations and political science, an eclectic group spanning the ideological and paradigmatic limits, have espoused individual arguments for the future international structure. We do not argue the merits of one conjecture over another, but use these predictions as a foundation for our discussion of the challenges that could confront America in the year 2047.

UNIPOLAR—U.S. SUPERPOWER

William C. Wohlforth (an Assistant Professor of International Relations in the Edmund A. Walsch School of Foreign Service at Georgetown University) believes that the current world structure is unambiguously unipolar, with the U.S. enjoying decisive preponderance in all the underlying components of power: economic, military, technological, and geopolitical. He also believes that unipolarity is prone to peace because it minimizes security competition among the other great powers (unlike a multipolar system, as evidenced by the numerous wars in the last 500 years among the great powers) and it is durable. It is already 10 years old and, if Washington understands its responsibility as the sole superpower, it could last as long as the bipolar structure and place us at the cusp of 2047. Such a unipolar world today and tomorrow is and will be built around U.S. power, and thus creates demands for American engagement. The United States must respond to the world as effectively as possible to ensure its position and peace worldwide. Today there is not a single major power that can balance against America and most nations have scaled back military expenditures faster than has the United States—probably because any effort to compete directly with the U.S. is futile. In the future, however, many states can be expected to invest in technologically advanced areas to compete against the U.S. or another country from an asymmetric perspective. (Wohlforth, 5-43)

MULTIPOLAR—ECONOMIC BLOCKS

Kenneth Waltz, another forecaster, believes the world will return to multipolarity within the next 10-20 years, adding Germany or another West European State, Japan, and China as the new poles in addition to America. Asia, Europe, and the Americas will likely emerge as regional economic blocs with Japanese, German, and U.S. leadership, respectively. The rest of the world

will become increasingly dependent on these three core regions in terms of technological developments. Beyond the next two decades, Russian military capability is unlikely to be matched economically, allowing the U.S. to remain the world's economic and military powerhouse. Russian weakness and the slow-to-catch-up regions of the German- and Japanese-led blocs will prevent an adequate check against the U.S. This outcome will encourage the other major powers to coalesce against the United States or politically distance themselves from U.S. initiatives. Waltz expects German movement toward Eastern Europe and Russia, Russian movement toward Germany and Japan, and the gradual withdrawal of the U.S. from Europe along with the demise of NATO. (Waltz, 50)

UNI-MULTIPOLAR—CIVILIZATIONAL

Samuel P. Huntington (a professor at Harvard University and director of the John M. Olin Institute for Strategic Studies), one of the West's most eminent political scientists, espouses a future in which bipolarity has given way to a hybrid uni-multipolar system with one superpower and several major powers. The settlement of the world's issues will require action by the superpower but always with some combination of other major powers in support. However, virtually all the major powers will assert themselves to promote their own distinct interests, and resulting in a truly multipolar world in the next several decades and possibly into mid-century. (Huntington, 37) What is unique about Huntington's multipolar world is that it is centered around seven or possibly eight civilizations that emanate from five different cultural traditions. Cultural identity will become pre-eminent, especially as the states gravitate toward their core strengths. Huntington believes conflicts will arise along fault lines that constitute civilizational boundaries. A global war is unlikely but could occur if fighting between neighboring civilizations escalates and others join in. He believes the most dangerous fault lines are found between Islam and Orthodoxy (centered on Russia), Islam and Hinduism (centered on India), Sinic (centered on China Hinduism), Islam and Africa, and Islam and the West. The West may also find itself up against a coalition of civilizations or a Sinic threat linked with Islam. Likely coalitions include Japan gravitating toward China or India and Russia against China. If China ascends to global preponderance, then it is likely that polarization could occur with U.S./Europe/Russia/India versus China/Japan/and the Muslim states. (Huntington, 1996, 207-297)

NO WINNERS

Paul Kennedy believes that by the mid-century, the population explosion, technological changes, and economic development will cause serious problems for world stability. The status of the political order will mean little as the world looks on at chaos. If the forces of change are great and interactive, the combined pressures are likely to spiral us to disaster with no winners. (Kennedy, 1993)

These four experts have provided their own individual thoughts on how the world will be structured, ranging from a unipolar world led by the U.S. to a world of chaos arising from unprecedented social problems with no real power center to provide influence. Given these extremes, what types of challenges are foreseen for the United States by the year 2047?

5. POTENTIAL CHALLENGES TO THE U.S. IN 2047

There are three likely challenges that could confront the U.S. and affect not only national security but international stability as well: a peer competitor to the U.S., environmental conflicts, and information/asymmetric warfare. A peer competitor is the most likely and difficult of the challenges that could threaten U.S. national security interests throughout the world. The two most likely nations or states to present such a challenge are the European Union and China. (Although the European Union was not specifically identified as a peer competitor by the analysts in Section 4, it is our contention that it is plausible, but not in the near term.)

EUROPEAN UNION

The Europe of today has the territory, population, wealth, and technological prowess to obtain superpower status. However, the development of Europe as a superpower is unlikely because it has a long history of self-determination and nationalistic fervor. History suggests the European Union will still be a union of integrated but separate nation states by the year 2047. Moreover, NATO (which will still include the U.S.) will still be a force due to America's ability to keep other states from attempting a hegemonic move. The U.S. provides each individual state with peace of mind concerning security. Although disagreements and trade issues will continue, they will be unable to sever the connection to the U.S. The steps toward European superpower status would involve resistance, trauma, and the need to build elite consensus—a consensus that even Kosovo was unable to build regarding how to prosecute the air war. Moreover, NATO would have to be dissolved and a reliable union budget accepted before a strategic arms race in parity with the U.S. could be undertaken and sustained. The main power instrument for Europe is its economic power. In a future environment where the emphasis in international relations will most likely be in the economic arena, Europe as a union will be able to wield its clout in 2047 a lot more pervasively without direct military parity with the U.S.

CHINA

China is a different story. China is a large country with a great history, but it has had a humiliating 160 years since the Opium war. Its current sense of geopolitical constriction may produce a new wave of nationalism. George Modelski and William Thompson in their article, "The Long and the Short of Global Policies in the 21st Century," argue that it is highly probable that China will challenge the U.S. if it believes America is determined to contain China. China could challenge U.S. interests and positions in East Asia and Western Pacific once it believes it has the capability to do so, which is likely by 2035-2050. (Modelski and Thompson, 127)

Economics

Experts in Asian affairs and some political analysts believe China will have the largest economy in the world by the mid 21st century and will be ranked second in the world power grid with a GDP larger than the U.S. and European Union combined by 2020. (Shambaugh) In the last few years, however, China has had to deal with several uncertainties concerning restructuring of state-owned enterprises and resulting employment issues and deflation affecting consumer demand. As a result, China's growth rate dropped from 7.8% in 1998 to approximately 6.5% for 1999. (Strategic Assessment 1999, 123-124) That withstanding, Chinese exports have increased as a result of renewed growth in East Asia and the continuing import growth in the United States. China also seems determined to gain entry into the World Trade Organization (WTO). WTO membership is expected to benefit China tremendously with a boost in foreign direct investment and improved access to foreign markets.

The increasing gap between U.S. exports to and imports from China could result in major problems for the U.S. if the U.S. becomes dependent on Chinese imports. For example, imports from China have risen from $41,362 million U.S. in 1994 to $65,832 million in 1997 compared with only a slight rise in exports during that same period from $9,287 million to $12,805 million. (World Bank, 1999) Moreover, if China is admitted to the WTO, and if it decides to become a foe vice friend, then the unilateral economic sanctions the U.S. could leverage would be nullified by China's ability to acquire its needs from other members of the WTO. China's armed forces are modernizing now for the "information dominated" battle space. If its economy continues its high rate of growth, by the year 2020 some of that economic power could be leveraged toward new technological advances in parity with the United States before mid-century.

Military: Asymmetric Warfare

The People's Liberation Army (PLA) is developing doctrine and systems designed to target adversarial strategic and operational centers of gravity, and to defend its own, to pursue limited political objectives with an "asymmetrical economy of force". Specifically, this strategy means

> targeting an enemy's forward-based command, control, communications, computers and intelligence nodes, airbases, aircraft carriers and sea-based C2 platforms as well as critical nodes in space. Striking the enemy's centers of gravity are meant to achieve their objectives without having to necessarily engage the adversary's fielded military forces in extended operations. (Stokes, 2)

Since the mid-1980s, the PLA has placed special focus on enabling technologies that allow it to play its own strengths and exploit adversarial vulnerabilities.

China's highest priority for strategic modernization is in the realm of information. Since the Gulf War, PLA officials have strongly advocated the aggressive pursuit of information-based warfare doctrine and systems. Some observers believe that by "adopting information-based approaches to warfare, China can effectively leapfrog into the 21st century as a preeminent

military power." (Stokes, 26) According to some Chinese observers, "warfare in the information era is a test of strength between intelligence capabilities of combat forces. Information superiority, is not necessarily determined by technological superiority, but by new tactics and independent creativity of commanders in the field." (Stokes, 28)

China has started today to counter the highest profile weakness of the U.S., its reliance on technology and computers as it prepares to fight the U.S. and seek regional hegemony.

> China's objective is to destroy the other sides willingness or capability to resist . . . not seize territory. Over-the-horizon warfare will be the strike force of the future. According to China, the key area of exploitation will be the enemy's reliance on complex computers; by destroying or incapacitating them, neither the computers or high-tech weaponry can operate. Capabilities such as jamming and information manipulation will be emphasized. (Stokes, 29)

Over the past decade, information technology has been the fastest-growing segment of China's economy, rising at an annual rate of 30%. (Zhang, 1) China has already deployed or is actively developing electronic reconnaissance satellites, electro-optical recce satellites, synthetic aperture radar satellites, missile early warning satellites, navigational satellites; strategic and tactical unmanned aerial vehicles, airborne early warning; space surveillance; counter stealth radars, SIGINT sites, tactical reconnaissance vehicles and ships, and special forces. Additionally, the electronics and space industries are developing a broad array of ground-based, airborne, and space-based sensors that Beijing hopes will guarantee battle space information dominance in any future conflicts around China's periphery. (Stokes, 32)

Information technology is characteristic of a major power of the 21st century, just as possession of nuclear weapons marked a major power in the 1950s, 1960s and 1970s. China's information revolution is driven by technologies available worldwide. Digitization, computer processing, precise global positioning, and systems integration—the technological basis on which a range of new capabilities depends—are available to any country with the money and will to use them systematically to improve military capabilities.

In the year 2047, it is quite likely that China will be a close peer competitor given its current structure and attitude toward the United States. Rhetoric aside, the United States is considered the enemy and China continues to pursue those objectives that allow her parity as a major global power and regional hegemony if she so desires. The U.S. will have to start looking at this potential future now if it is to counter the new Chinese "information warfare"-oriented strategic strategy. The Air Force is right now the one service with the expertise to lead a future dominated by an info-centric military.

Resources

Another challenge for the U.S. will revolve around energy and resource issues in the year 2047. In the past, environmental factors have indirectly contributed to conflict, but with the

environment coming under greater stress and resources diminishing, such factors could be direct causes of conflict by mid-century. U.S. forces may be needed to ensure adequate supplies for the western democracies. Such actions could include securing lines of communication to key oil and gas fields or protecting vulnerable countries with large resource reserves from attack. The U.S. may have to counter rogue governments that have the oil revenues to acquire weapons of mass destruction.

The Department of Energy forecasts that world energy consumption will grow 2.3 percent annually, as it has since 1970. By 2020, world consumption will be three times that of 1970. What will it be by 2047? (Strategic Assessment, 43) The U.S. is the world's largest consumer of energy, but energy consumption is growing rapidly in Asia. Future demands will come from China and India. Asia's consumption of oil is expected to rise from 11.3 million barrels a day (mbd) in 1995 to 28.6 mbd by 2020 and more in the later years. Of all energies, natural gas consumption is growing the fastest. Its share of world energy consumption rose from 17.5 percent in 1970 to 21.4 percent in 1995 and is projected to be 27.2 percent in 2020. (Strategic Assessment, 43) According to Zbigniew Brzezinski, in "The Grand Chess Board," the next powder keg may be the great stretch of land between Brest and Vladivostok. Herein lies the politically fragile chunk of Central Asia where still unmeasured supplies of oil and gas are contained. If the world's economy continues growing like it is today, there will be widespread demands for alternate sources of energy. China is already looking at building pipelines to bring Central Asia's oil directly to China, avoiding the risk of an American-Japanese blockade of the sea-lanes. (*Economist*, July 99) Michael Pillsbury quotes Chinese security analyst Yang Shuheng:

> The rivalry over the Caspian Sea region's oil and natural gas is part of the U.S.-Russian rivalry over strategic interests and spheres of influence in the Eurasian hinterland...The number of countries involved (in the struggle) will increase. The European Union also regards the Central Asian region as an energy resources base that can replace the Gulf in the future...International forces covet the treasure chest that is Central Asia. (Pillsbury, 289)

It is clear that abundant natural resources will probably be a target of struggle between the major powers.

The growing threat of water scarcity, however, will have the greatest potential for instigating conflict and world instability. History is replete with examples of violent conflict over water, from competition for desert oases and water holes and the battle between the Mesopotamian cities of Lagash and Umma in 4500 BC to the fighting between Syria and Israel over Syria's attempts to appropriate the headwaters of the Jordan River in the 1960s. (Ya'ar, 48) Water conflict is most likely when rivers are shared by multiple users and downstream users are vulnerable to decisions made by upstream states. Twenty percent of the world's population is supported by the 200 largest river systems; 150 of the systems are shared by two nations, with the

remaining 50 shared by three to 10 nations. (Young et al., 21) Obviously, the potential for conflict is significant and the world will look to the U.S. to ensure equitable distribution and mitigate these regional conflicts from exploding into a global conflict.

Information/Asymmetric Warfare

Information warfare is likely to remain a major challenge for the U.S. through the mid-century. Technologically advanced, information-intensive nations are more vulnerable to information-based warfare simply because they are information dependent. (Ryan, 114-115) In 2047, the most likely warfare against the U.S. will be against its economic and national infrastructure. This battlefield will be as threatening as any encountered in military warfare. Moreover, the nations of the world will have become so intertwined as a result of the international dependencies associated with the global economy that national sovereignty could be redefined. Conflict between nations and nongovernment organizations could be as likely as those between two nation-states. The U.S. will probably no longer dominate emerging technologies by 2047 and many technologies will be easily acquired on the open market. Military and economic competitors can be expected to have just as capable and sophisticated weapons as America. (Busey, 13) Because world economies will be the foundation of any wealth-making, at least through the mid-century, financial institutions will probably continue to be the prime targets in attempting to reduce the overall power of the nation and influence a system to change. Disrupting an adversary's economy will directly affect the ability of the system to support its military forces, provide the nation's organic essentials and infrastructure, and eventually weaken the leadership's political base. (Arnold et al, 181-187)

Harnessing the technological revolution during the next half century will be essential to meeting national security needs. By 2047, information will be the unifying architecture for all political and military actions undertaken by the United States. The United States will use it to congeal, convince, coerce, and defeat its opponents. If we are not prepared to think of information in these lethal ways, then someone else will—to the detriment of America's security and prosperity.

6. NATIONAL MILITARY STRUCTURE

The first few chapters of this paper have attempted to identify the type of environment the United States may be faced with by 2047 and the potential challenges she could face. It also shows that the potential for the United States to fall from its "superpower" status is based on historical precedence of the past 500 years. What then does this world of 2047 portend for the United States Air Force and how will it and the other services have to evolve to meet national security needs? In the mid-21st century, American security and ability to project power and defend the homeland will be built around a National Defense Force, a joint civilian-military organization, led by a CINC schooled in airpower doctrine. Air Force doctrine will evolve into information-nodal centric doctrine, resulting in the Centennial Air Force being the service most capable of attacking and defending against the most likely threats, one with asymmetric warfare characteristics and/or a peer competitor.

INFORMATION AS THE UNIFYING ARCHITECTURE

For America, information and knowledge will be the unifying architecture for political and military actions by mid-century. Although the information age is in its infancy, now is the time for the United States to build a vision for its future and not be complacent about its own capabilities relative to the rest of the world. We must embrace the information revolution as we did the industrial revolution, with innovative and visionary concepts. We have already seen the effect information technology can have on our security. On 7-8 February 2000, hackers executing a coordinated attack knocked out five of the largest electronic-business sites on the internet. (Satran, 2000) If an "enemy" (whoever it is) can do this today, America's vital infrastructure could be attacked in the next few years (maybe sooner) if we don't put together a coordinated military and civilian effort for defense and, if need be, an attack capability. We need to lay a foundation for a future National Defense Force centered on information-centric nodal warfare. This doctrine will influence enemy leaders' behavior through direct and indirect actions. A single CINC, taught in the art of airpower and information warfare, will integrate both civilian and military forces in an effort to organize those capabilities necessary to meet a particular threat. More important, cyber-operators will be as critical to the defense of this nation tomorrow as our troops and pilots are today.

GLOBAL THREATS—GLOBAL VIEW

The globalization of threats—from peer competitors to local civil wars, or asymmetric warfare—demands the U.S. look at the world as a whole. We must have a global view and not arbitrarily divide the world into independent regions. We must be able to deal with foreign

challenges that appear to emanate from within our borders, such as a cyber attack, or meet head-on the aggression of one nation against an ally. To meet this challenge, we much go beyond today's interagency task forces for dealing with these threats. In 1997, the General Accounting Office saw a weakness in the counter-drug interagency task force effort. It criticized the Joint Task Force (JTF) organization as being too rigid to adapt to new technologies and challenges brought forth by a determined opponent. (GAO, 1997) Currently, multiple task forces are springing up inside the government to deal with the cyber world, while much of industry is attempting to deal with the same problem in its own world. Both the FBI and CINCSPACE have responsibility for computer network defense. (Loeb, 2000) Resources that could be synergized to field a potent future defense are being wasted in compartmented efforts. This paper is not advocating a military takeover of the role of the police or any other agency, but it does advocate a unified military and civilian command structure—the National Defense Force—led by a single combatant commander with the Air Force as its predominant offense and defense against the enemy.

The National Defense Force will be a joint civilian and military operations team to face the broad spectrum of threats, whether terrorism, cyber-attack or conventional attack against our vital interests overseas. The National Defense Force will include portions of today's intelligence community, Department of Justice, Department of State, and Department of Defense. The diversity of threats demand the integration of government effort to ensure ongoing and planned operations support national political objectives.

The realization that the U.S. military may be required to cope with contingencies even within the U.S. is already in the U.S. code. Specifically, Title 10 section 382 provides for military support to the Department of Justice for cases involving "biological or chemical weapons of mass destruction." (10 USC Sec 382) Further, under Title 18 USC section 831, "Prohibited transactions involving nuclear materials," military assistance requested by the Attorney General includes the power to "arrest persons and conduct searches and seizures...." (18 USC Sec 831) Once again, we are not advocating the military take over the role of the police—simply a unified military and civilian command structure to deal with threats to national security.

The United States Combatant Commander will be responsible to the National Command Authority (the President and the Secretary of Defense) for guidance and direction. The CINC will work hand-in-hand on a daily basis with the Secretaries of Defense, State, and Justice. The functions currently performed by the regional CINCs will be centralized and performed by the new Combatant Commander. The new CINC will have a continuing, broad-ranging mission. He will monitor and prepare for changes required by day-to-day political and diplomatic maneuvering with foreign countries and nongovernment agencies. The CINC will be responsible for planning and execution of attacks on our adversaries, including all levels of operations from covert warfare to major war. The CINC will also be responsible for homeland defense, including

our national systems and infrastructure. There are several systems critical to our national survival that reside solely in the private sector. The CINC will communicate and coordinate to ensure that the security of these systems are not breached and prepare contingency plans in case they are attacked. During a conflict, the CINC will exercise Combatant Command (COCOM) command authority over the National Defense Force. In short, the CINC will integrate all available information, plan, and execute in the continuum from diplomatic state-to-state contact to open warfare.

FORWARD PRESENCE

Allied support will remain critical if America is to bring full force to bear on an adversary. We must develop systems and architectures that are capable of "plugging in" our allied forces. It is in our best interest to develop and maintain the overall integrating resources and specialty capability required to project power. C4ISR and air-to-air refueling are examples of unique resources required to project power outside a local contingency.

In 2047 our National Defense Force will be expeditionary in nature and based in the United States. It will be commanded by a deployed regional JTF commander. The most likely exception would be a standing JTF in the Pacific to handle a hegemonic challenge by China. The remaining functions currently performed by the regional CINCs will be centralized and performed by the new Combatant Commander. The speed of communications will enable many of the combat planning and execution functions currently performed by the geographic CINC to be done within the United States. While not having the same presence as today's regional CINCs, the deployment of the JTFs and commanders on a regular basis will help to ensure continuing contact and personal interaction with our allies. Additionally, our allies will be invited to deploy to U.S. based exercises. This regular operation will build trust and ensure interoperability.

The lack of a continuous overseas presence will necessitate a strong exchange program. The presence of our fighting forces and planning staffs in foreign countries increases mutual understanding. For our troops, it provides an opportunity to learn more about the culture and environment in which someday they could be called to fight. For our allies, their presence in the U.S. increases their knowledge of Americans and our capabilities. This exchange builds personal relationships and better understanding. To make up for the lack of continuous presence, we need an energetic exchange program to transfer how we fight to our allies and build critical interpersonal relationships. Operator exchange programs and intelligence sharing will help to make up for the lack of continuous overseas presence. In addition to exchange programs, strong military liaison officers and attaché programs are needed.

AIR FORCE'S LEAD ROLE

In the mid-21st century, the National Defense Force will be based on the evolutionary growth of airpower doctrine. The single CINC will have a global view, employing expeditionary forces under the command of a regional JTF commander. The expeditionary force will deploy on a regular basis to exercise with our allies and support combat operations. Airpower doctrine will have integrated information warfare as a mission and information-centric nodal warfare will become both the Air Force and National Defense Force doctrine. The Centennial Air Force will be the service of choice, capable of attacking and defending against asymmetric warfare or a peer competitor. Airpower puts fewer American lives at risk, and the inherent characteristic of speed will be required in the increasingly transparent world of 2047.

7. NEW WARFIGHTING DOCTRINE . . . INFORMATION-CENTRIC NODAL WARFARE

> At the heart of warfare lies doctrine. It represents the central beliefs for waging war in order to achieve victory. Doctrine is of the mind, a network of faith and knowledge reinforced by experience which lays the pattern for the utilization of men, equipment, and tactics. It is the building material for strategy. It is fundamental to sound judgment.
>
> Gen Curtis Emerson LeMay, 1968

Our Combatant Commander needs forces and doctrine capable of directly influencing, persuading, and coercing an opponent leadership in 2047. This enemy leader will be someone who has the ability to alter the course of his country's events and align the outcome with the U.S. desired end state. Implementing Clausewitz's war as an extension of politics approach, the CINC will be continuously engaged. He will monitor and prepare for changes required by day-to-day political and diplomatic maneuvering with foreign countries and nongovernment agencies. In addition, the CINC will plan and execute attacks on adversaries at all levels of operations from covert warfare to major conflict.

To address the asymmetric nature of conflict and attacks directed at our vulnerabilities and weaknesses, the U.S. will need a new definition of the enemy and a new war-fighting doctrine. This definition and concept will constitute the cornerstone of information-centric nodal warfare. Put simply, we can no longer think of the enemy as the country or its leader. The true enemy and the focus of our effort must be the enemy leader's mind. The leader in this case is the individual (or group of individuals) who has the capability to change the present course of action.

ROLE OF INFORMATION IN WARFARE

To meet future challenges, the U.S. National Defense Force must embrace and build forces to employ information-centric nodal warfare. Information has long been recognized as a key to warfare. In the past, information on the enemy's location allowed forces to close and join in combat. Force-on-force combat was crucial in Napoleonic warfare and was echoed by American naval strategist Alfred T. Mahan. Mahan believed that to win control of the ocean you must engage and destroy the opposition a la Trafalgar. He blasted the French for their inappropriate use of ships:

> ...the miserable policy of a government which taught them first to save their ships, to economize the material, prevented French admirals from reaping, not the mere glory, but the positive advantages that more than once were within their grasp. When Monk said the nation that would rule upon the sea must always attack, he set the key-note to England's naval policy; and had the instructions of the French government consistently breathed the same spirit, the war of 1778 might have ended sooner... (Mahan, 1991)

Currently, information is used to avoid an opponent's strengths. The famous "left hook" in Operation Desert Storm is a classic example of a flanking maneuver to avoid a head-on engagement. Airpower doctrine was built on this concept of avoiding the heavily armed surface forces and striking deep at the enemy's unprotected centers of gravity. Aircraft in route to and from targets will take various non-direct routes to avoid or at lease minimize the exposure to enemy air defense systems.

When the Air Force turns 100 years old, information and knowledge will be the focus and reason for employing forces. Information will allow us to know who *"really"* controls the adversary's power; it will enable us to select methods that will convince or coerce him; and it will be how we select targets. In some cases, information will be the weapon itself. We may have already have seen a 2047-style information operation. On January 30, 2000 the London *Sunday Times* ran an article titled "Bomb video took fight out of Milosevic." The article states "America sent Yugoslav army generals a video showing the devastating effect of one of its most potent weapon—the vacuum, or fuel-air, bomb—shortly before Slobodan Milosevic gave in . . ." (Walker; Luka, 2000) The article implied that the video was the turning point when Milosevic saw what lay in store. Was this the deciding factor? All that can be concluded at this point, if the article is accurate, is that the video probably didn't hurt the allied cause.

GOAL OF WARFARE

The key to achieving satisfactory results is keeping the desired end state in mind and understanding why we are fighting. Specifically, our goals should be to compel the adversary to do our will, avoid creating more problems in the process, and avoid the loss of American lives.

Once our goals have been defined, we should ask ourselves: "Who should we fight?" If we say we are going to fight the opponent's army, navy, or air force, it becomes a self-fulfilling prophecy. Likewise, if we prepare to fight the adversary's military, then we fight the military. But who should we be waging war against? If we don't want to eliminate an adversary's forces, then we should be fighting the individual or individuals who hold the power and have the ability to stop the aggressive action and comply with our will. This person will sometimes be the civilian leader and at other times a military leader.

With a better grasp of the two fundamental questions—what is the desired outcome and who should we be fighting—much of today's debate over the proper targets for airpower would be eliminated. However, debate continues. Should our effort be directed against the fielded forces or against strategic targets, and in what proportions? True airpower believers say that strategic targets are the real center of gravity and nodal attack is compelling. This view was not universally held in the execution of the Kosovo campaign. For example, the *Washington Post* series, "The General's War" described an ongoing argument between the Army's General Wesley Clark, the CINC and Air Force Lieutenant General Michael Short, the air component commander.

General Clark saw the fielded forces in Kosovo as the center of gravity whereas General Short saw President Milosevic and his country as the center of gravity. (Priest, 1999) Who was right? Using our construct, if Milosevic had the decision capability, then he would be the center of gravity; however, since we want to avoid creating more problems than are solved, there may have been political issues that precluded such initial strategic focus.

FUTURE DOCTRINE: INFORMATION-CENTRIC NODAL WARFARE

The key to information-centric nodal warfare is using force to support information dominance. The primary target is the leadership. Secondary targets are industrial capacity, national will, and, ultimately, national survival. The doctrine is nodal. The enemy leader's mind is the center of gravity. If you can't attack the leader's mind, then influence and attack the information that feeds the decisions. The information might flow from various sources at ever-expanding distances from the leader. Consider how the following capabilities could be used to affect the enemy leader's mind:

- Control information delivery to all levels of leadership: Covertly insert information by feeding the enemy leader what we want him/her to see while we control the content (true or false).
- Control national infrastructure and imbedded systems: Have the ability to turn water and power on and off.
- Go directly to the people: Broadcast a message to everyone with a radio, TV, FAX, or computer.
- Control national wealth: Manipulate banking and financial institutions.

The above list would have a tremendous influence on the national leadership and the outcome of a conflict.

The information-centric nodal warfare construct is used by the National Command Authority; the Departments of State, Defense, and Justice; and the Combatant Commander to decide on a course of action. Further, it aids in deciding what implements of power to use to affect the information flow to the adversary and enemy's leaders' minds. The following diagram depicts this overarching construct with sea, land, air, space, and cyber all quivers in the arsenal. It is useful for the continuous monitoring of activity for diplomatic purposes to aggressive major warfare.

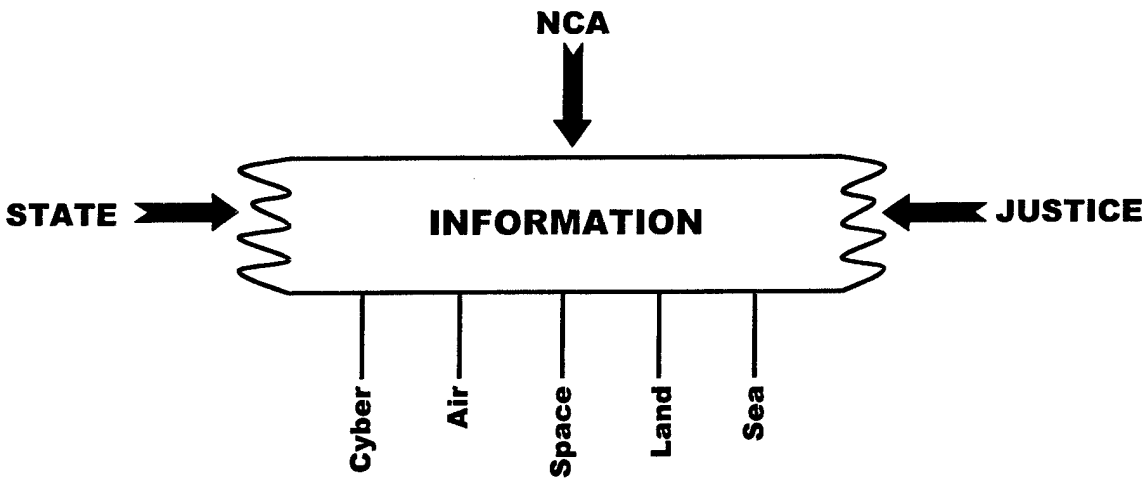

Figure 1--National Military Structure

Information is the backbone for developing a nodal attack plan. In a simplistic example, a tipoff is gained by cyber infiltration of sensitive mail. Next, a submarine inserts a small covert strike team to place a node on the enemy's "secure" command network. After the network is compromised, an unmanned combat aerial vehicle or tailored computer program destroys an alternate, uncompromised communications switch. A satellite network relays commands and communications to the node placed by the inserted team. All components work in tandem to control the information available/delivered to the advisory leadership.

The construct will be applicable at the tactical, operational, and strategic level. A message covertly inserted in the enemy's command communications could influence a leader not to launch a surface-to-air missile, to maneuver forces in anticipation of a non-existent threat, or to conclude he will lose or the cost is too high for the cause.

At the tactical level, manned or unmanned aircraft could pass through a sophisticated air defense network if the operators and/or computer systems were provided incorrect information. For example, the identification could be wrong, or a missile control site could be brought to believe that another site was targeting the aircraft or that the aircraft track was moved to vacant airspace. Other situations could involve direction to turn on or off individual radar sites to increase the effectiveness friendly antiradiation missiles. These are air examples, but the same could apply to the land or sea. Each would give a measurable increase to the effectiveness and ultimate outcome at the tactical level.

The operational level can be demonstrated for a business environment. Say you are a senior vice president and the CEO is leaving for a week's travel. You believe you have a good grasp of what has to happen during the boss's absence. But after the boss leaves you get an e-mail, phone message, or combination of messages telling you to redirect the company's efforts toward a new development project that the company is working. (By doing so you miss a contract award on another lucrative project.) When the boss returns, you figure out that you've

been had, but it is be too late to recapture the contract. Without evidence of the redirection, you may be fired.

In the strategic case, the target of this information-centric nodal warfare will be the country's leader(s). Let's assume the readiness reports from his troops reflect lower than actual levels and the intelligence estimates are increasing for the opposition forces. Based on this information, the leader could be convinced that it was in his or his country's best interest to negotiate a settlement. During the negotiations, the side employing information-centric nodal warfare has a tremendous advantage by knowing the opponent's hand.

This advantage can be applied both subtly and not so subtly. Speeches, news articles, and television appearances can be subtly altered. Subliminal messages employing Hollywood commercial techniques could be added to the context of news, third-party television, or internet home pages. The goal would be to disassociate the leader from the people, his troops and his advisors or to redirect the enemy's efforts to promote parts of the economy to the exclusion of others, making them more dependent and vulnerable to U.S. influence.

One could also overtly attack the leader with a mass broadcast to the enemy's people and troops. The broadcast could tell them how the leader has violated international norms and the people of the world bear them no ill will but his actions have to stop. Tell them the banking system will be shut down and to collect water because the power and water will be turned off until the leader stops his inappropriate behavior.

The objective and desire for information-centric nodal warfare are in place but the tools are crude. This is changing now and will continue to change throughout the information revolution. By focusing on the key questions—what is our desired end state and who should we be fighting—we see that the enemy leader's mind is the key to achieving our goals. We have used Psychological Operations directly against fielded forces and populations. The difference in the new concept is that we can directly attack information feed to enemy leaders at several levels: tactical, operational, and strategic. By 2047, if we do our jobs correctly, the tools will be available to ensure our peace and prosperity.

HISTORICAL SUPPORT FOR INFORMATION-CENTRIC NODAL WARFARE

This information construct is well supported through history. The legionary Sun Tzu's prescriptive commentary, *The Art of War*, introduced several enduring truths of warfare. He highlighted the need for information in warfare, the cornerstone of information-centric warfare:

> If you know the enemy and know yourself, you need not fear the result of a hundred battles. If you know yourself but not the enemy, for every victory gained you will also suffer a defeat. If you know neither the enemy nor yourself, you will succumb in every battle. (Sun Tzu, Ch 3, #18)

Sun Tzu also introduced the concepts of centers of gravity, mass, maneuver, surprise, and deception (security), all key to our doctrine. He talked of the need for quick victory. "In war, then, let your great object be victory, not lengthy campaigns." (Sun Tzu, Ch 2, #19) He stressed that the best method for achieving victory is to inflict your will on the enemy without getting engaged, thereby preserving your forces for use after the battle:

1. Sun Tzu said: In the practical art of war, the best thing of all is to take the enemy's country whole and intact; to shatter and destroy it is not so good. So, too, it is better to recapture an army entire than to destroy it, to capture a regiment, a detachment or a company entire than to destroy them.

2. Hence to fight and conquer in all your battles is not supreme excellence; supreme excellence consists in breaking the enemy's resistance without fighting.

6. Therefore the skillful leader subdues the enemy's troops without any fighting; he captures their cities without laying siege to them; he overthrows their kingdom without lengthy operations in the field.

7. With his forces intact he will dispute the mastery of the Empire, and thus, without losing a man, his triumph will be complete. This is the method of attacking by stratagem. (Sun Tzu, Ch 3, #1,6,7)

The concepts of Sun Tzu stated here go hand-in-hand with our information-centric nodal warfare construct, as does Carl von Clausewitz' (1780-1831) writings. Clausewitz believed the ultimate purpose in war and war itself is "an act of force to compel our enemy to do our will."(Clausewitz, 83) In our construct, we have further defined the enemy to be the leader's mind. Clausewitz supports the concentration of force on the enemy's strategic center of gravity as the exploitable weak link.

> One must keep the dominant characteristics of both belligerents in mind. Out of these characteristics a certain center of gravity develops, the hub of all power and movement, on which everything depends. That is the point against which all our energies should be directed. (Clausewitz, 720)

The classic airpower prophets—Hugh Trenchard, Giulio Douhet, and William "Billy" Mitchell—all supported the concept of avoiding heavily defended fielded forces to strike at the heart of the enemy. The English strategist, Liddell Hart, is specific that the true aim of combat is to compel the enemy to do your will. According to Hart, "The true aim...is not so much to seek battle as to seek a strategic situation so advantageous so that if it does not of itself produce the decision, its continuation by a battle is sure to achieve this." (Hart, 325)

World events in 1937, Hitler's rise to power, and the Axis alliance helped clarify U.S. strategic thinking. Until this time the U.S. had concentrated on the Monroe Doctrine. The Air Corps Tactical School (ACTS) espoused the broad-ranging concept that the submission of the enemy was the real goal of war and this could be achieved directly through disrupting national

life. Disruption could be achieved through the precise attack of vital points and thereby the enemy's war-making capability. (Greer, 53, 76-106) These concepts translated into the WWII bombing strategy of precision, high-altitude, daylight strategic bombardment. The concept was to target "rail lines, refineries, electric power systems, and (as a last resort) water supply systems...an invader would quickly and efficiently destroy the people's will to resist."(Faber, 194) Much discussion focused on the critical points that would bring down the enemy system. Looking at the enemy as a system is the foundation of nodal attack in our construct and is further defined by John Warden. The school's efforts were hampered by lack of economic intelligence. To compensate for this problem, they projected U.S. industrial vulnerabilities on Germany. In our construct, information is the cornerstone for all action.

During the time between WWII and John Warden's *Air Campaign*, the country struggled with limited war in an era of massive retaliation and containment. Additionally, according to Carl Builder in *The Icarus Syndrome*, the Air Force lost its doctrinal basis and worshiped at the alter of technology. (Builder, 155-164)

To build an enduring doctrine, Warden suggests examining an enemy as a system from its inside out. He uses a five-ring analysis model and draws parallels to the human body. The center of Warden's five rings is leadership, which can be affected by disrupting communications. The next ring is organic essentials (power, oil, food, and money). Infrastructure (roads, airfields, and factories) is the next ring. His last rings are population and fighting forces. He argues that parallel attack using these rings will have a synergistic effect, ultimately compelling the enemy leader to capitulate. (Warden, 1995) Warden is also specific as to the benefit of targeting the enemy's fielded forces:

> The last ring holds the fielded military forces of the state. Although we tend to think of military forces as being the most vital in war, in fact they are means to an end. That is, their only function is to protect their own inner rings or to threaten those of an enemy. A state can certainly be led to make concessions by reducing its fielded military forces and if all of its fielded forces are destroyed, it may have to make the ultimate concession simply because the command element knows that its inner rings have become defenseless and liable to destruction.
>
> Viewing fielded forces as means to an end and not necessarily important in themselves is not a classical view in large part because the majority of the classical writing and thinking on warfare has been done by continental soldiers who had no choice but to contend with enemy armies. Modern technology now, however, makes possible new and politically powerful options that in fact can put fielded forces into the category of means and not end. (Warden, 1995)

Our construct shares the concept that leadership is critical, but in our case the mind of the leader is the focus. We share the belief that avoiding the force-on-force engagement is the best use of our power. However, there may be situations in which attacking the fielded force is the

only viable political option. We must be prepared to use our information-centric nodal warfare in that role as well. We also share Warden's system and nodal approach. Warden contends that:

> When the command element cannot be threatened directly, the task becomes one of applying sufficient indirect pressure so that the command element rationally concludes that concessions are appropriate, realizes that further action is impossible, or is physically deprived of the ability to continue a particular course or to continue combat. (Warden, 1995)

It's interesting to note that Warden's second ring, the organic essentials, encompasses the same target sets originally proposed by Air Corps Tactical School for strategic bombardment. Both Warden and the school argue that destruction of key nodes, also known as fatal weaknesses, will bring political and economic repercussions that are too great for the enemy leadership to bear. (Warden, 1995) In our construct, the leader will be the center focus of all our actions.

Our construct of information-centric nodal warfare shares many of the salient features found in established doctrine. Centers of gravity have and continue to be recognized as key to military operations. Clausewitz established that compelling the enemy to do your will is the ultimate goal of military operations. Most agree that it is better to avoid a force-on-force attack with the enemy. As Sun Tzu points out, it is better to have your entire fighting force available than to expend it in combat. Most agree that if you cannot directly attack the leadership, an indirect attack will eventually have the desired result. Douhet believed that the indirect target was the population and should be subjected to explosive, incendiary, and chemical weapons attacks. Corbett believed the indirect target was to threaten the enemy's sea commerce. For Mitchell, ACTS, and Warden, the targets were the vital nodes of power and war-making. In every one of the above examples, information is present but was avoided as a direct or indirect target.

8. CENTENNIAL AIR FORCE

The Air Force is becoming the preferred vehicle of national power. The air and space power doctrine avoids the carnage of force-on-force combat. Airpower doctrine is based on delivering force against vital center(s) of gravity while avoiding protracted force-on-force engagements. The Centennial Air Force must evolve these attributes to meet America's security needs, whether defending against asymmetric threats or challenges from a peer competitor such as China. PLA writings show a shifting doctrine with a multidimensional, greatly expanded battle space, encompassing the electromagnetic spectrum with air, sea, and space. The foundation of this emerging doctrine is the concept of information dominance. Information dominance, according to Chinese military scholars is "achieved through command and control warfare using a combination of airpower, special forces and strategic missiles to strike an adversary's C4I structure." (Stokes, 9) Moreover, open-source Chinese military writings suggest China is NOT as friendly as we want to believe. America is the enemy and it is China's quest to be one of five major powers by mid-century, when its relative power will have increased while America's has decreased. Several sources in Michael Pillsbury's *China Debates the Future Security Environment* suggest there are ongoing programs looking at ways China can defeat the United States. These programs are focusing on exploiting the Revolution of Military Affairs (RMA) by tailoring new technology to defeat the superior with the inferior, using an asymmetric strategy. (Pillsbury, 285-296; Parry and Anthony, NAIC discussions) There is no doubt that the Air Force of tomorrow will be the "force of choice" to ensure U.S. freedom of operations and to conduct counter operations in support of national security objectives. Cyber operators will be needed to reach out and touch the enemy and at the same time protect our country from a "bit" invasion.

AIRPOWER'S GROWTH

Airpower is just now coming of age and we have just begun to exploit the aerospace medium. Mankind has walked the earth for millennia; he successfully navigated the high seas only during the past 600 years; and only in the last 100 years has the aerospace environment been tapped—beginning in 1903 with Orville and Wilbur's historic 12-second powered flight. The Air Force's creation in 1947 is just over 50 years ago. The Soviets' launch of the first satellite, Sputnik, was in 1956. John Glenn's historic flight in the "Friendship 7" Mercury spacecraft took place in February 1962. (NASA, 1998) Man first walked on the surface of the moon in 1969 and construction of the international space station is ongoing.

Airpower's coming of age has dramatically increased the lethality and efficiency of weapon systems. In World War II, it took 9070 2000-lb. bombs to achieve a 90 percent probability of a hit on a 60 x 100 foot target. (Mann, 107) Fifty years later in Desert Storm, a single F-117

Night Hawk could strike two independent targets on a single sortie. Eight years after Desert Storm, the B-2 Spirit dramatically increased this number with 16 independently targetable near-precision weapons. During the Kosovo operation, precision weapons were key to this dramatic change, and now we have an even more precise weapon that limits collateral damage and effectively destroys the enemy; that weapon is information and information in warfare.

Trends in airpower doctrine will enable the use of air combat arms without risking significant numbers of American lives and running the risk of having American forces in costly engagements. Giulio Douhet, in his 1921 book, *The Command of the Air*, said the airplane allowed complete freedom of operation and enabled quick victory. (Douhet, 187-88) Much of today's doctrine is built with that concept in mind. In Kosovo, the strong desire to avoid the loss of American lives resulted in a 76-day air-only campaign, with the loss of only two aircraft and recovery of both pilots. We foresee American's intolerance to casualties continuing and therefore information warfare is the next logical evolution in airpower doctrine.

The Air Force's inherent speed will be required in the ever-increasing information-dominated world. In 1965 Gordon Moore, the co-founder of Intel, noted that the amount of storage a microprocessor can hold doubles every 18 months; this pace has not let up. (Moore, 1965) Today we can e-mail, telephone, or videoconference anywhere in the world in near real time. Billy Mitchell foresaw this shortening of the response timeline and its implication for airpower. "The air is a common medium all over the world. It is bounded by no oceans, mountains, rivers or deserts." (Jones, 1) He further said: "Not only will every part of the world be reached but the world itself will be made correspondingly smaller because distance will be measured in hours and not in miles." (Jones, 1997, p. 1-2)

Not only can we use information against the enemy, but it can be used against us. As the pace of communications increases, so will the visibility into what once could be hidden military operations. The Internet has greatly improved our ability to communicate around the world, but it has also opened the door to reveal a wealth of information about ourselves. For example, on the Pennsylvania state web site, the entire state fiber optic infrastructure is available to anyone who cares to see. (http://www.oit.state.pa.us/atlas/) This transparency extends to space systems, increasing the availability of timely intelligence and near-intelligence-quality multi-use commercial space products. This evolution in transparency will favor responsive forces—those that require little time to engage or leave no visible trace of engagement. Instruments of war that do not keep or accelerate this pace of change will become obsolete.

AIR FORCE RESOURCES

In keeping with the Air Force's premise of avoiding heavily armed fielded forces and directly attacking centers of gravity, the Centennial Air Force will have embraced the cyber

environment as the primary medium of employing information-centric nodal warfare. To fully embrace airpower's true potential, the Centennial Air Force will have a fully funded cyber corps.

Asset allocation in the Air Force has and will continue to change. See Figure 2 for the budget breakout from its inception in 1947 through its becoming the Centennial Air Force. The inclusion of cyber forces is similar to the development of space forces. With cyber, like space, the purpose of the existing force is in some degree replaced and in other cases enhanced with the addition of the new medium. By 2047 cyber dominance will have a real financial commitment. A significant amount of the budget will be used to maintain state-of-the-art computers, to orchestrate the latest computer encryption/decryption code-breaking game, and to train and maintain a knowledgeable cadre of cyber personnel.

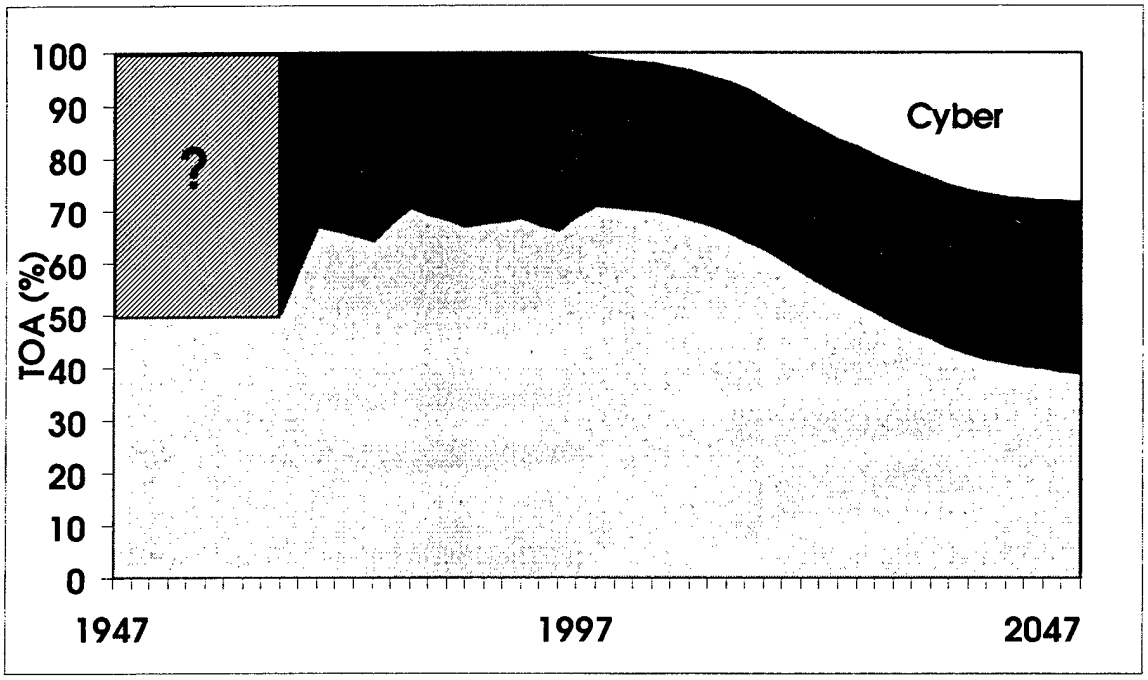

Figure 2--Air Force Budget Breakout

Note: Historical data for this chart came from *Air Force Magazine*, May 1999, for years FY90-99. For years 1962-1986 the data came from *The U.S. Air Force Budget and Posture over Time*, Kevin N. Lewis (RAND) 1990. Parametric analysis of the strategic forces, and intelligence and communications major programs were used to allocate air and space. Research and development; supply and maintenance; and training, medical, and general personnel were proportionally allocated.

Other points to be gleaned from the diagram are the indistinct boundaries between cyber, space, and air. These boundaries have always been more words than reality. Is a ballistic missile air or space? Would an operation to compromise a foreign network that uses our satellites be cyber or space? Today we use space assets to provide information to pilots. Tomorrow this synergistic effect will encompass cyber, space, and air assets. Another point evident in the diagram is our belief in a continuing need for air-breathing (atmospheric) forces to allow us to

deal with the multifaceted threats. While we believe that the Air Force will be the preeminent force and that cyber will be a key component in our information-centric nodal warfare, we must maintain the ability to kill the enemy. The Centennial Air Force must have the capability to exert physical force since history has shown that conflicts will continue throughout our future.

In the 40 years of the Cold War, for example, there were 190 regional conflicts, an average of four per year. In the first seven years after the end of the Cold War, there were 193, an average of 28 per year, seven times that of the former yearly average. The majority of these conflicts occurred in Africa; although they were civil conflicts, they still posed a threat to world peace and stability and that trend is likely to continue given future resource scarcity issues coupled with exploding populations. (Pillsbury, 37-50) Chinese analysts see the struggle for economic resources as a major contributor that could lead to direct conflicts between the major powers. If economics and resources are the issue, then America must have the ability to project its forces worldwide to ensure access to those critical resources, be it oil and gas in Central Asia or water in the Middle East. More importantly, and a prime example, however, is the threat to an ally, specifically Taiwan. The hostile or even the benign occupation of Taiwan by China could have a devastating effect on America because Taiwan is the only country that produces a specific composite necessary to hold memory modules together. (Parry and Anthony, NAIC discussions) It would be paramount for America to have the capability to use physical force to ensure the integrity of Taiwan, or for that matter any country whose freedom is critical to the security of America. The use of space to ensure a country's security will become increasingly necessary in the future.

The boundary between air and space allocation will change if it becomes politically acceptable to deliver destructive force from space. The decision whether to place a particular capability in orbit, sub-orbit, or atmosphere needs to be made on the basis of cost, coverage, responsiveness, and dwell time. We postulate a combination of systems to allow monitoring and force employment in the 2047 environment.

The Centennial Air Force will operate from the air (air, space, and cyber) and from that position will have the capability to affect and control other mediums. These elements of airpower can hold key centers of gravity at risk without transiting the heavily armed forces. As Glenn Kent and David Ochmanek put it in their paper *Defining the Role of Airpower in Joint Missions:*

> By virtue of the nature of their mediums, the inherent characteristics of forces operating in those mediums, and the continuing enhancements to the effectiveness and lethality of these forces, air forces and space forces have the potential to dominate the conduct of enemy operations in all mediums—operations on the land, at sea, in the air, and through space and operations by enemy leaders in exercising sovereignty over their country. (Kent and Ochmanek, 11)

In 2047 this dominance will extend to the cyber environment.

AIR FORCE CULTURE

To employ information-centric nodal warfare, the Air Force must develop an information warrior/cyber force culture. The foundation of this effort is being laid in today's Developing Aerospace Leaders (DAL) project. (Hassan, 2000) While today's efforts focus on developing an air and space culture, in 2047 this culture will be information-based and include the application of force through air, space, and cyber. Our future warrior must also understand the unique capabilities of non-Air Force assets such as stealthy submarines. We will need smart, well-trained, and educated people who will monitor the global environment and develop information warfare tactics that merge air, space, land, and sea elements into a combined arms campaign plan.

We must develop an information warrior culture and cyber troops. We need an officer corps that understands the application of force in its traditional means but that is also schooled in the capabilities of using information to support these forces as well as a weapon. This culture must be integrated into our accession training, officer professional development, operational exercises, and the assignment system. For example, the Red Flag of today must include a well-integrated Red Team leadership infrastructure where we can employ our air, space, and cyber quivers in a synergistic manner.

For the Non-Commissioned Officer, we need to develop technical schools to teach the manipulation of network traffic, decryption of communications, covert tapping of secure networks, and development and placing of imbedded programs and monitoring systems. We need troops knowledgeable enough to divert probes of our systems into designated information wells where we maintain what we want to be seen. Training must not focus solely on the cyber troop; we also must train a corps of cyber warriors. These troops will be valuable assets not only to the government but to the private sector as well. After these well-educated individuals finish their uniformed service, they will be in a position to help maintain and enhance the U.S. commercial information edge.

The culture of the U.S. Air Force will have to expand from one of employing air and space forces to one of employing air, space, and cyber forces to gain an informational advantage. In a sense, every Air Force member will be an information warrior capable of operating in various mediums—electronic, free space, and vacuum.

AIR FORCE MISSIONS DRIVE EQUIPMENT

Today, much is being made of integrating air and space—our core competencies—and using current Air Force mission vernacular to describe new and evolving fields, such as information. It is our contention that overemphasis on mission vernacular leads to stove-piping and lack of an integrated vision. The Air Force of tomorrow will employ a new construct of *information-centric nodal warfare* that applies the lessons of the past to the world of tomorrow. We

must avoid the current limiting description of Air Force missions and turn to enabling technologies in two arenas: freedom of operation and counter-operations.

Freedom of operations and counter-operations are a continuing game. Aircraft were used to attack ground targets, fighter aircraft were used to attack those aircraft, fighters were then used to attack the fighter aircraft, and surface-to-air missiles were used in turn to attack the aircraft—and the cycle will continue. This cat-and-mouse game is not limited to the airplane; it also applies to land, surface sea, subsurface, space, electronic combat, and cyber forces. We must keep this point-counterpoint pattern in mind and build not only freedom of our operation capability but counter-operations capability as well.

Freedom of operation is any action taken or equipment that enables our forces to have uninterrupted control of the information flow to the enemy leader(s). In a transparent world, preparatory actions will be seen. To enable freedom of operation, we see a growth potential for nondetectable/nontraceable and stealthy weapons. Examples are high-power directed-energy or genetically tailored biological weapons directed toward an individual.

Counter-operation is any action taken or equipment that stops the enemy from controlling information to our leaders. It includes strong network defense systems, and may include setting up less-well-defended dummy networks that give the enemy something to direct efforts toward. This strategy may increase our ability to then feed the enemy desired information.

In this pursuit of information dominance, keeping a close eye on what other countries, nations, corporations, and independent actors are pursuing is paramount. Once a technology is established, it is hard to make believe it doesn't exist. The VCR was developed in the United States but was not pursued, only to be mass-produced by Japan. Additionally, once we develop it other countries will attempt to duplicate it. For example, once the U.S. developed and used the A-bomb at the end of WWII the USSR developed their own A-bomb. Additionally, Russia now has a discarded attempt to duplicate the space shuttle.

In developing systems for the future, we can be well served by calling to memory the naval theorist Julian S. Corbett's caution about concentrating all efforts in only one area.

> Consequently in seeking to strike our enemy the liability to miss him is much greater at sea than on land, and the chances of being eluded by the enemy whom we are seeking to bring to battle become so serious a check upon our offensive action as to compel us to handle the maxim of "Seeking out the enemy's fleet" with caution. (Corbett, 139-145)

9. CONCLUSIONS

We were intentionally extreme and provocative in our approach and hope that this research will force others to look at what the role and character of the U.S. Air Force should be at its 100th birthday. To lay the foundation, we looked at the historical examples of the decline of great powers, the rise of the U.S. to superpower status, and the potential futures and challenges of the 2047 world. Next, we proposed a new national military structure, war-fighting doctrine, and the Centennial Air Force.

Currently, the United States is the lone superpower in a unipolar world without hegemony. However, the potential for America to decline in power relative to the rest of the world remains high. Based on Paul Kennedy's conclusions about the factors involved in the decline of previous great powers, there is indeed a causal relationship between the economic and productive balances of a nation and its relative power in the world. The U.S. is today where Britain was in its zenith. Britain maximized the industrial revolution and became the economic center of the world. Although it did not pursue military might over the relatively equal military status of the other nations of that time, it did command the largest percentage of the world's production output, and had one of the largest populations and per capita output. Today, instead of the industrial revolution, America is running with the "information revolution" and economically has captured the world once again. It has a military second to none and its political influence is felt throughout the world. America has seen decline and has risen from its grip. The U.S. was in a gradual decline in the 1980s, but the fall of the Soviet Union and the advent of the information revolution has propelled the United States into a superpower position never before seen. However, the relative strengths of leading nations never remain constant. Despite the significant lead that the U.S. has over the rest of the world, it must be diligent to remain either a superpower in a unipolar world or one of the great powers in a mulitpolar world.

The national security strategy of the future will be one of diversity yet focus. The challenges China could provide if it chose to pursue hegemony in Asia must be met forcefully and head-on by a military capable of defeating "over the horizon" weapons. China is already planning to use information as a weapon as is evidenced by Maj Gen Pan Junfeng's remark that "We [China] can make the enemy's command centers not work by changing their data system" and "We [China] can cause the enemy's headquarters to make incorrect judgments by sending disinformation." (Gertz, 2000) Not only is China a significant information warfare threat, but such technologies will continue to threaten the security and economic prosperity of America and possibly the world. It will be imperative that America develop an information-centric federation of forces to handle the diverse onslaught of information-type warfare attacks. Moreover, as the population of the world reaches almost 10 billion by the close of mid-century, the increase in

conflicts worldwide will occur as states fight over critical resources. The U.S. will most likely still be the only nation capable of global reach and the nations of the world will still look to America to not only support diplomatic initiatives in these areas, but also to use whatever military power is required to ensure access to vital resources.

The variety of traditional and nontraditional threats brought about by competition for resources from rising powers and the ensuing economic repercussions will dictate a new paradigm for the U.S. national security structure. Unity of Combatant Command in the government will replace our current regional CINCs. The Combatant Commander will be involved in the continuum from diplomatic action to covert and overt warfare. Armed forces will be mostly based in the U.S., functioning in an expeditionary manner. These forces will deploy and exercise with forces from our allied countries to counter a broad spectrum of conflict.

The U.S. will employ information-centric nodal warfare, including adopting a new definition of the enemy as the opponent's leader's mind. Information will allow us to know who *"really"* controls the adversary power, enable us to select methods that will convince or coerce him, and influence how we select targets. In some cases, information will be the weapon itself. The key to information-centric nodal warfare is that all force application must support information dominance as the primary leadership target and secondarily on industrial capacity, national will, and ultimately national survival. The doctrine is nodal. The enemy leader's mind is the center of gravity. If you can't attack the leader's mind, then you influence and attack the information that feeds his decisions. This information might have to flow from various sources at ever-expanding distances from the leader.

Finally, the Air Force will be the U.S. preeminent war-fighting force. It is young, getting more precise, avoids risking large numbers of U.S. troops, and has the speed to adapt to a changing environment. To execute information-centric warfare, the Air Force will field a cyber corps, develop an information warrior culture, and equip forces to allow freedom of our operations and counter opponent operations. The fundamental doctrine of the Air Force remains the same—go around the fielded forces to attack vital centers of gravity—only the medium has expanded.

This is not an easy task; it requires real force using cyber/information as a means of attack and defense. It requires good information on the adversary, including observations and intent. We must also inoculate our society against such an attack through intelligence, communications, and cyber assurance.

As President Kennedy said in 1962 addressing the growing threat in Vietnam:

> These are extraordinary times. And we face an extraordinary challenge. Our strength as well as our convictions have imposed on this nation the role of leader in freedom's cause...Yet their aggression is more often concealed than open. They have fired no missiles; and their troops are seldom seen. They send arms, advisors, aid, technicians, and propaganda to every troubled area. But when fighting is

> required, it is usually done by others—by guerrillas striking at night, by assassins striking alone. (Giap, xvi-xvii)

These indeed are extraordinary times and we do face extraordinary challenges. The Air Force today is looking for a new vision. That vision must encompass a look at our future missions and not concentrate on the hardware. The Air Force is the dominant service today in regard to information warfare and its uses both as a weapon and for our nation's defense. We must continue to cultivate those efforts and articulate the role of the Air Force in its mastery of the air, space, and information medium. Air and space superiority are only an extension of information superiority and we must prepare for that focus today. If we're not willing to accept the decline of our great nation, then we must have the courage to look past the short term. We must use our innovative strengths to tackle the future challenges and we must do it now.

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